Project Manager's Quarterly Progress Report – 2nd Quarter FY 2002
U.S. Large Hadron Collider Construction Project

1. PROJECT IDENTIFIERS

Reporting Period:	Through **March 31, 2002**
Program Sponsors:	DOE High Energy Physics Division/NSF Physics Division
DOE/NSF Program Manager:	John O'Fallon, (301) 903-3624, john.OFallon@science.doe.gov
DOE/NSF Associate Program Manager:	M. Goldberg, (703) 306-1894, mgoldber@nsf.gov
Operations Office:	Chicago Operations Office/Fermi Area Office
DOE/NSF Project Manager:	J. Yeck, (630) 840-2530, jim.yeck@ch.doe.gov

2. PROJECT DESCRIPTION

The Department of Energy (DOE) and the National Science Foundation (NSF) have signed agreements committing to collaboration in the construction of the Large Hadron Collider (LHC) at CERN (European Laboratory for Particle Physics) and two of its associated detectors. The U.S. fabrication effort will be carried out at, or under the supervision of, U.S. universities and national laboratories under the terms and conditions described in the International Collaboration Agreement (Agreement) and its Accelerator and Experiments Protocols. The U.S. LHC Construction Project is defined by the goods and services to be provided to CERN under the terms of the Agreement between DOE, NSF, and CERN. These goods and services include DOE contributions to the LHC accelerator, and DOE and NSF contributions to the ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid) experiments.

The DOE contribution to the LHC accelerator consists of items provided by DOE National Laboratories and CERN direct purchases from U.S. industrial firms. The scope of these contributions is addressed in the Accelerator Protocol and described in detail in an Implementing Arrangement between the collaborating DOE National Laboratories and CERN. The DOE and NSF contributions to the ATLAS and CMS detectors consist of items supplied by the collaborating U.S. universities and DOE National Laboratories. The scope of these contributions is addressed in the Experiments Protocol and described in detail in Memoranda of Understanding for collaboration on construction of each experiment.

The U.S. LHC Construction Project includes the U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator Construction projects. This report summarizes the overall status of the U.S. LHC Construction Project effort and includes more detailed status information on each sub-project. Additional information can be accessed at the following web sites:

U.S. LHC Project - http://www.hep.net/doe-hep/lhc.html

LHC Project - http://wwwlhc.cern.ch/	U.S. LHC Accelerator - http://www-td.fnal.gov/
ATLAS - http://atlasinfo.cern.ch/Atlas/Welcome.html	U.S. ATLAS - http://www.usatlas.bnl.gov/
CMS - http://cmsinfo.cern.ch/Welcome.html	U.S. CMS - http://uscms.fnal.gov/

3. PROJECT MANAGER'S NARRATIVE HIGHLIGHTS

The current list of DOE/NSF project reviews and status meetings is provided below:

U.S. LHC Construction Project	Event	Date
U.S. CMS Detector	DOE/NSF Quarterly Status Meeting	March 1, 2002
U.S. ATLAS Detector	DOE/NSF Quarterly Status Meeting	March 6, 2002
U.S. LHC Accelerator	DOE/NSF Quarterly Status Meeting	April 18, 2002
U.S. CMS & ATLAS Detectors	DOE/NSF Review	June 3-6, 2002
U.S. LHC Accelerator Project	DOE Review	June 10-11, 2002
U.S. LHC Program/Project	Joint Oversight Group Meeting	June 13. 2002

The results of these activities are documented in formal reports and meeting notes. The U.S. CMS and ATLAS projects submit monthly reports and the U.S. LHC Accelerator project submits a quarterly report. Current performance data is summarized in the following tables:

Table 3.1, Schedule Performance Indices

	Planned Complete (BCWS/BAC)	Actual Complete (BCWP/BAC)	Schedule Performance (BCWP/BCWS)
U.S. ATLAS	62%	62%	100%
U.S. CMS	75%	67%	90%
U.S. LHC Accelerator	81%	75%	93%

Table 3.2, Contingency Status (in thousands of dollars)

	Total Project Cost (TPC)	Budget at Completion (BAC)	Contingency	Budgeted Cost of Work Performed (BCWP)	Remaining Work to be Performed (BAC-BCWP)	Contingency/ (BAC-BCWP)
US ATLAS	163,750	137,858	25,892	85,123	52,735	49%
US CMS	167,250	142,409	24,841	95,898	46,511	53%
US Accelerator	110,000	102,336	7,664	76,891	25,445	30%

Table 3.3, Cost & Schedule Performance (in thousands of dollars) Indices

	Cumulative Costs to Date					Costs at Completion		
	Budgeted Cost			Variance			Revised	
	Work Scheduled	Work Performed	Actual Cost	Schedule	Cost	Budgeted	Estimate	Variance
U.S. ATLAS	85,449	85,123	84,512	-326	611	163,750	163,750	0
U.S. CMS	106,595	95,898	83,688	-10697	12210	167,250	167,250	0
U.S. LHC Accelerator	83,069	76,891	78,281	-6178	-1390	110,000	110,000	0
CERN Invoices	30,213	30,213	30,213	0	0	90,000	90,000	0
U.S. LHC Total	305,326	288,125	276,694	-17201	11431	531,000	531,000	0

4. PROJECT MANAGER'S ASSESSMENT

The U.S. projects continue to meet their goals and are reliable and influential partners in the construction of the ATLAS and CMS detectors and the LHC machine.

Cost – Cost performance is good. The cumulative Coct Performance Index (CPI) for the total U.S. LHC Construction Project (U.S. ATLAS, U.S. CMS, and U.S. LHC Accelerator) is 1.1, which is favorable. Each project maintains an adequate level of contingency. The current Estimate At Completion for the U.S. LHC Accelerator project indicates that contingency is marginal and needs to be monitored closely.

The U.S. LHC Accelerator project office continues to actively and aggressively manage remaining contingency, and ensure realistic estimates for completion of all three Labs' activities. The project office has not approved any baseline changes this quarter, but a number are under development or review, including development of a new cost estimate and additional engineering for the cryo-genic feedbox fabrication. U.S. CMS contingency is presently at 55% of remaining costs, which is considered sufficient to bring the present scope in successfully. U.S. CMS does not plan to use contingency in the near term, including any further scope considerations in FY02, in order to maintain a steady and adequate level. Possible future contingency may be needed for additional electromagnetic calorimeter chip (FPPA) submissions to address design issues on this critical path item. U.S. ATLAS contingency is presently at 49% of remaining costs, which is considered sufficient to bring the present scope in successfully. The U.S. ATLAS project continues to carefully manage contingency. The results of a sensitivity analysis for each subsystem to re-confirm realistic contingency estimates will be presented at the next project review in June '02.

Schedule – Schedule performance is measured by milestone completion and by earned value. The total U.S. LHC Construction Project schedule overall is slightly behind plans with a cumulative Schedule Performance Index (SPI) of 0.94 , indicating no major slippages in schedule. The total U.S. LHC Construction Project is sixty-seven percent complete based on earned value. A CERN schedule delay of one year has been announced, and formal approval is expected in June '02. The new schedule calls for first beams in April 2007. A period of beam commissioning will be followed by start of the LHC Physics Program in the latter half of 2007. U.S. LHC Accelerator Project milestones for deliverables had been updated and approved to reflect the previous CERN LHC installation schedule. The updates define adequate float between expected U.S. delivery dates (based on the U.S. production schedules) and CERN installation requirements. A delay in the LHC machine schedule is not expected to have adverse impact on the U.S. LHC Accelerator Construction Project schedule.

Schedules for both detector projects will need to be revisited after the international collaborations re-evaluate schedule following the recent announcement of the more realistic LHC machine schedule (i.e. delay of colliding beam until 2007). It is now clear that the completion of a small percentage of the U.S. ATLAS and U.S. CMS Construction Project scope or "deliverables" will be delayed beyond September '05 (JOG Project Completion milestone). This scope is intimately tied to the CERN LHC start-up schedule. The U.S. LHC Project Office

is working with the appropriate project offices to quantify the exact scope impacted and to develop strategies for addressing this issue.

Technical - Good technical progress continues across the project, and we remain confident that the U.S. deliverables to CERN can be realized with the planned funding. The U.S. LHC Construction Project deliverables are accepted by CERN and approved by the DOE/NSF Joint Oversight Group. We expect to provide additional items to CERN, within the approved funding, should cost performance be favorable. Important milestones continue to be met. The first LHC Accelerator MQXA cold mass was received at Fermilab from Japan-KEK and testing of the first D2 dipole was initiated at Brookhaven. The U.S. CMS Hadron Calorimeter Optical Megatile factory at Fermilab has completed construction of all megatiles. The first U.S. ATLAS electromagnetic Forward Calorimeter module has been completed. Additional technical Project highlights are given in the report, and shown in the photos.

ISSUES

LHC Cost & Schedule- CERN management presented draft plans to the CERN Council in March, '02 to address the increased costs for completion of the LHC. The new plan includes a one-year delay in LHC start-up to 2007, which takes into account the delay that is already forecast in delivery of the superconducting cable. CERN will redirect funds to the LHC, expected to amount to 500 MCHF, with compensatory reductions being made in other CERN scientific programs. Reports of the External Review Committee and internal task forces were also presented to the CERN Council, recommending changes in CERN management organization, industrial/service contracting and research program priorities. CERN management is addressing these recommendations on operating efficiencies in its planning for LHC completion. CERN will seek approval of its overall LHC completion budget plan and schedule from the CERN Committee of Council at the June '02 meeting. To allow normal running of CERN until then, Council agreed to release 20 MCHF from the 5% of the Laboratory's 2002 budget held back pending resolution of LHC funding issues.

ATLAS and CMS Resources– At the April '02 Resource Review Board (RRB) meetings, collaborations were asked to bring budgets and construction/installation plans in line with the new official LHC machine schedule (LHC start-up with beam now expected to be April 2007). The collaborations were asked to continue searching for further savings and new collaborators to cover funding shortfalls identified for detector construction completion (resulting from cost overruns, improved cost estimates, exchange rate problems, earlier civil construction delays, and some funding agencies not meeting commitments). They were asked to reach agreement with funding agencies as to availability of additional construction funds by June '02 and to then prepare financial plans taking all available funding into account. The U.S. position that no additional construction funds are foreseen given the funding cap established in the International Agreement, was again communicated to the CERN Directorate. The RRBs asked that requested collaboration plans include all detector staging, deferrals and displacement funding needed to build well-defined 'initial' detectors for first operations according to the official LHC machine schedule.

5. NARRATIVE SUMMARY

5.1 U.S. ATLAS CONSTRUCTION PROJECT

ATLAS International- ATLAS continues to evaluate and present a number of detector staging scenarios to alleviate the funding shortfalls previously identified to the LHC Committee (LHCC). Major areas of staging involve portions of inner tracker, calorimeter read-outs or scintillators, muon chambers and high luminosity shielding . The ATLAS construction completion and installation schedule is undergoing revision to take into account the more realistic LHC machine schedule and an increased installation period. Below are additional international ATLAS highlights:

- UX15 main cavern excavation progresses toward completion anticipated next quarter; an assessment of readiness to undertake installation work was conducted, with positive results;
- Huge ATLAS toroid magnet components continue to arrive at CERN: coil casings from Germany, coils from Italy; End-Cap toroid Vacuum Vessels from Holland; assembly trials to exercise underground installation have been done.
- Trigger & Data Acquisition (DAQ) activities are shifting to final prototyping work to support completion of the technical design report later this year.
- Inner Detector Silicon Barrel module components and cylinders are in production, with > 50% of all sensors delivered with excellent quality.

U.S. ATLAS- As of March 31,2002 the project is 66% complete, reflecting the most recent update of cost and schedule estimates for the remaining work to complete the baseline scope. Forecast dates above have been revised to reflect the latest schedule estimates. A Quarterly Status meeting was conducted by the U.S. LHC Project Office on March 6, 2002, at Duke University, where Transition Radiation Tracker (TRT) barrel module production work is done. Progress with a TRT technical design issue (see below) and muon system electronics testing and production continues to be monitored.

- Silicon Strips: Testing of electronics chips is continuing on schedule with yields that have remained constant at close to 23%. Close to 20% of chips needed for the experiment are available.
- Transition Radiation Tracker: progress on the glass wire-joint degradation technical issue continues with decision on solution planned next quarter; barrel module production activities have been optimized while wire-joint solutions are evaluated.
- Liquid Argon Electromagnetic Calorimeter: All feedthroughs necessary for the barrel cryostat have been produced; first Forward calorimeter module assembly completed.
- Tile Hadron Calorimeter: All standard submodule construction activities have been completed at ANL. 52 of 64 modules have been fully assembled and 42 have been shipped to CERN.
- Muon: 103 out of 240 Base Monitored Drift Tube chambers are produced and 44 have been outfitted with gas systems and Faraday cages. Both U-Michigan and U-Washington are well into their Series 3 chamber production, while the Boston Muon Consortium is retooling for their 3rd series.
- Trigger/DAQ : Phase 2 software work is progressing. U-California Irvine has begun to make significant contributions to parts of the Data Collection software; work continues to integrate the offline and level 2 selection frameworks.

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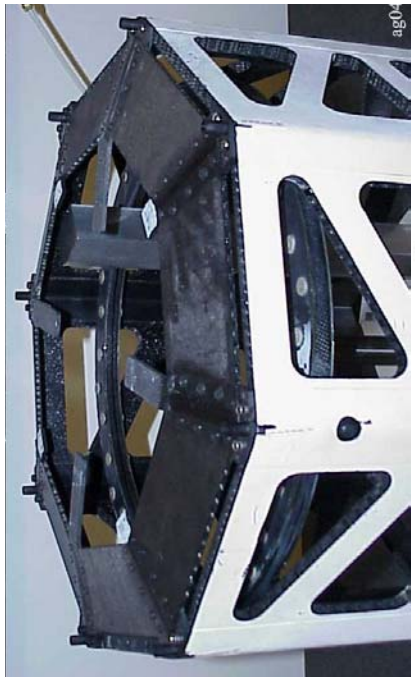
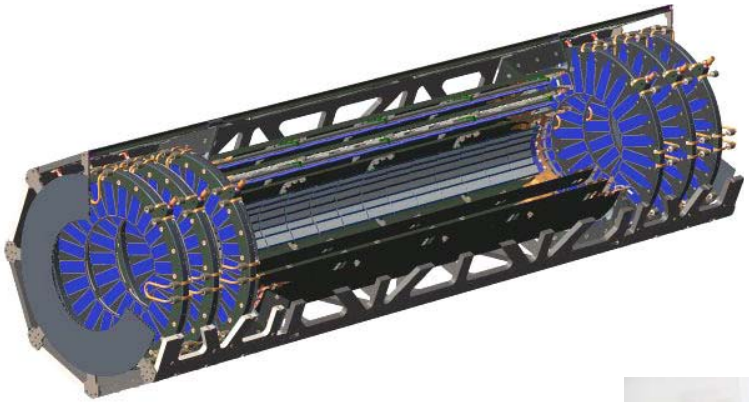
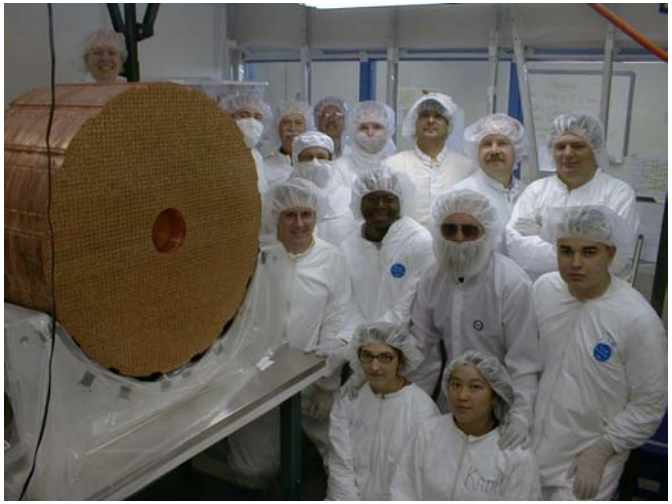




Left- ATLAS Inner Detector Pixel and Silicon Strip system efforts are led by LBNL. Pixel work includes mechanics, sensors and electronics. Computer model at left shows Pixel System global support structure (cut-away) and pixel disk ring structures at each end. Photo at far left shows a global support structure and disk ring prototype assembly at LBNL. These systems were approved for production at LBNL in February '02.

Right- Muon Cathode Strip Chamber (CSC) produced at BNL. 4 of 32 required CSC's have been produced and are being tested by BNL. Production of other muon chambers is well along, with 103 of 240 Monitored Drift Tube (MDT) chambers produced by the University of Michigan, University of Washington, and the Boston Muon Consortium (several Northeast universities).



Left- The mechanical assembly of the first electromagnetic Forward Calorimeter module (section 1C) has been completed at the University of Arizona. The module consists of a stack of 18 round copper plates, each about one inch thick, 90 cm in diameter, with 12260 precision drilled holes in it, to accommodate the tube/rod electrode assembly. This module is in the process of being packed up for shipment to CERN, where it is supposed to arrive early July 2002. There are two ATLAS Forward Calorimeter assemblies, each one made up of three such modules.

5.2 U.S. CMS CONSTRUCTION PROJECT

CMS International- CMS continues to evaluate and present a number of detector staging scenarios to alleviate the funding shortfalls previously identified to the LHC Committee (LHCC). Major areas where the shortfall is concentrated are the Electromagnetic Calorimeter, Silicon Tracker, Muon System, and "commissioning & integration" costs previously assumed to be a CERN responsibility. The CMS construction completion and installation schedule is undergoing revision to take into account the more realistic LHC machine schedule and anticipated CMS cavern availability. Below are additional international CMS highlights:

- Underground cavern UXC55 has been excavated to the full length and has broken through the LEP tunnel; delivery of civil construction completion is July, '04.
- Electromagnetic Calorimeter photosensors (Avalanche Photo Diodes and Vacuum Photo Triodes) are well into production , with good results in meeting radiation and magnetic testing acceptance criteria.
- CMS management is working with the LHCC and CERN management to address test beam needs and work-around given the planned unavailability of SPS test beam in 2005 as a CERN cost-cutting measure.
- Eight industrial firms received CMS awards for innovative or exceptional contributions, including seven firms for magnet/superconductor work and one U.S. firm, Plascore Inc, for production of endcap muon chamber plastic panels.

U.S. CMS- As of 31 March 2002, the overall U.S. CMS Construction Project was 68% complete vs. the scheduled 75% complete. A DOE/NSF Quarterly status review was conducted at Fermilab on March 1, 2002, which focused mostly on project completion planning and the US CMS transition into pre-operations. The U.S. CMS construction project is on budget, with no major schedule slippage. U.S. schedule for completion is de-coupled from the international schedule with the exception two subsystems, and schedules for these systems are being evaluated. Currently FY03 planned commitments indicate adequate contingency will be available for the current set of US deliverables. Below are a few highlights of the U.S. CMS Construction Project.

- Endcap Muon: CSC panel production is >75% complete and on cost and schedule. Chamber production at Fermilab is >50% complete, and also near cost and schedule. CSC testing at the US FAST sites (UCLA and U-Florida, managed by UC-Riverside) has begun with the existing Anode Local Charge Trigger (ALCT) and DAQ electronics;
- Hadron Calorimeter: both the HB-1 and HB+1 barrels have been delivered to CERN. HB-1 has been fitted with optical megatiles and reassembled at SX-5. The optical megatile factories are now 100% complete, a 3-year endeavor completed on schedule; factories are now refitting for production of HCAL readout boxes;
- Assembly of the endcap steel yokes are on cost and schedule, with obligations to the CMS Common Projects essentially complete.
- Trigger/Data Acquisition (DAQ) Application Specific Integrated Circuit (ASIC) prototypes for the calorimeter trigger are being fabricated; DAQ construction philosophy remains 'as late as possible' procurement to maximize technological advances, taking the delay of the LHC and international CMS schedule into consideration as appropriate.

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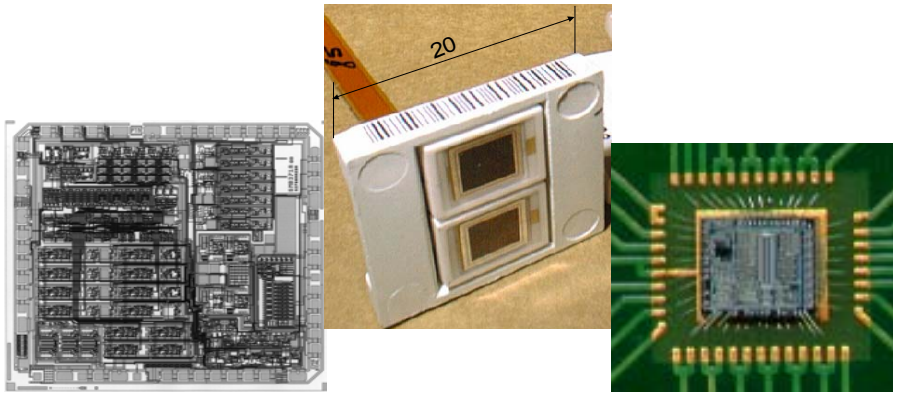
Above- U.S. CMS completed Common Project contribution at SX-5 building, CERN. Three Endcap Yoke assemblies, delivered by the University of Wisconsin.

Below- U.S. CMS-University of Iowa Physicist Yasar Onel next to Forward Hadron Calorimeter (HCAL HF) modules recently delivered to CERN Building 186. HCAL HF is made up of steel-plated absorber-modules with embedded quartz fibres.

Right- a quartz fibre test stand at Building 186, using quartz fibres provided by the University of Iowa.



Left- CMS Electromagnetic Calorimeter readout elements U.S. CMS is responsible for. From left to right: FPPA-Floating Point Preamplifier electronics chip (25 mm^2 in size); APD-Avalanche Photo Diode unit (two APDs per calorimeter crystal); and ADC-Analog-to-Digital-Converter chip. University of Minnesota, LBNL and Northeastern University share responsibilities for development , design, production or radiation testing of these elements, in accordance with overall CMS design requirements.

23,000 APDs out of 120,000 required have been delivered; LBNL has taken lead from non-U.S. partner on improving design of FPPA to meet CMS specs; ADC's are undergoing routine radiation qualification.

5.3 U.S LHC ACCELERATOR CONSTRUCTION PROJECT

LHC Accelerator- CERN is finalizing a management plan in response to the international External Review recently completed., to be presented to CERN Council in June, '02. The plan is expected to: reschedule LHC start to '07 (accounting for forecasted superconducting cable delay); refocus Lab-wide resources on LHC Project; re-organize the CERN Accelerator Sector; review policies to optimize balance and cost of internal vs. external (contracted) human resources; and strengthen financial monitoring, controls and accountability (including introduction of "Earned Value" concept). The LHC project continues good progress in many areas:

- CERN injectors have achieved LHC beam structure, proton bunches separated by 25 nano-seconds, and work on reducing bunch amplitude fluctuations continues.
- Seven complete LHC dipoles at CERN have reached nominal magnetic field (8.3 T) without quenching and six of seven have reached 9 T; twenty-six collared coils have been produced over the last year.
- LHC 120 m prototype full-cell magnet string is being completed; first half-cell was cooled to nominal 1.8k and shown to behave stably over several months.
- Contracts for 400 MHz RF klystrons have been placed and first delivery is expected later this year.

U.S. LHC Accelerator- As of March 31, 2002, the overall project was 75% percent complete versus the scheduled plan of 81% percent complete. A DOE quarterly status review was conducted April 17, 2002 at LBNL. Overall technical progress remains good, and management is finalizing plans to move the last remaining major item, the cryogenic feedboxes, into production. Contingency will be reduced to address engineering change requests and remains a concern that is being closely monitored. The schedule of deliverables is slightly behind plans, but well in advance of CERN requirements. Project highlights are listed below:

- [Fermilab] There is good progress with inner triplet quadrupole magnet production. The two cold masses that will make up the MQXB (Q2) magnet were completed and positioned on the cryostat assembly stand. The first MQXA cold mass was received from Japan (KEK). It arrived in excellent condition in large part due to the precautions taken based on experience gained in shipping a model magnet from KEK last year. The MQXA successfully passed all electrical checks upon receipt.
- [BNL] Three of the five D1 magnets have been successfully tested. The first D1 magnet is ready to ship to CERN. Five of the nine D2 magnets have been completed. The first D2 magnet to be cold tested has been installed on the test stand, cooldown begun, and testing will take place next quarter.
- [LBNL] The TAN and TAS beam absorbers are well into the procurement phase and many parts and pieces are on hand at LBNL. The pre-assembly review was successfully completed. The cryogenic feedbox final design is about 99% complete. Design work is focused on producing, checking and approving drawing packages for the eight feedboxes. The feedbox production readiness review was delayed to allow more work to be completed on the design, interface specifications and production documents.

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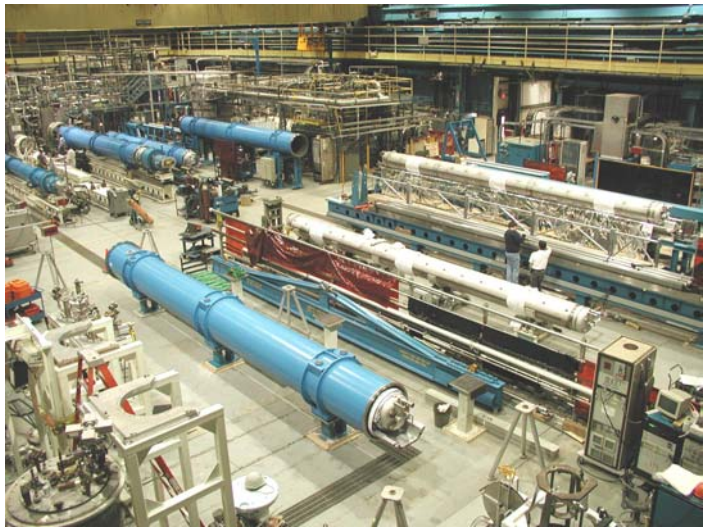


Above- BNL U.S. LHC Magnet production floor. All five D1 Dipole magnets are complete, and three are undergoing quench and field performance tests. Five of 9 D2 dipoles are complete, with all D2 coils wound, and cold masses for three in production.

Above- Fermilab U.S. LHC Magnet production floor. Five of eighteen Interaction Region quadrupoles are completed or in production. Shown in the foreground are completed cold masses for three of these quadrupoles, a completed collared coil assembly for one, and a completed Japanese-KEK provided quadrupole cold mass that Fermilab will integrate into a completed Inner Triplet quadrupole assembly. The completed quadrupoles are undergoing tests, and preparations are underway to assemble the first complete "Q2" element using two of these quadrupoles.

Left- Absorber components under production at LBNL. Far left are "copper clamshell" assemblies for the secondary beam absorbers (TAS) that protect the Inner Triplet elements. Red element at left is steel shielding for the neutral beam absorber (TAN) that protects the Interaction Region dipoles.

CERN Direct Purchases - DOE reimburses CERN for their payments to qualified U.S. vendors [Reference U.S.-CERN Agreement and Accelerator Protocol]. The status is shown in Table 5.1.

Table 5.1, Status of DOE Payments (in $000)

Contract Item Contract Item	Company (U.S. Supplier)	Amount Paid	Contract Price	w/ options & escalation
Niobium-Titanium Alloy Bars	Wah Chang	23,902	38,667	48,431
Niobium Sheets	Wah Chang	3,386	5,633	6,951
Polyamide Insulation Film	Kaneka High Tech Materials	920	5,425	6,510
Superconducting Cable	Outokumpu-Advanced Superconductor	1,550	16,447	20,985
LHC BPMS Button Feedthroughs	Ceramaseal	90	898	1,003
Cryogenic Temperature Sensor	Lakeshore	365		
Cryogenic He Mass Flowmeters	(tbd-contract in process)	0	1,200	1,200
(tbd-contract in process)	(tbd-contract in process)	0	(tbd)	3,134
Totals		30,213	68,270	88,214

6. FINANCIAL/COST STATUS AND PLANS

TOTAL PROJECT FUNDING PLAN (then year millions of dollars)*

Fiscal Year	FY96	FY97	FY98	FY99	FY00	FY01	FY02†	FY03	FY04	FY05	Total
Machine Funding Profiles (DOE)											
US LHC Accelerator	2.00	6.67	14.00	15.40	24.92	19.16	10.10	8.70	6.13	2.92	110
CERN Direct	0.00	0.00	0.00	8.09	8.29	8.08	11.20	13.40	23.20	17.74	90
Machine Total	2.00	6.67	14.00	23.49	33.21	27.24	21.30	22.10	29.33	20.66	200
Detector Funding Profiles (DOE and NSF)											
US ATLAS	1.70	3.71	10.05	25.63	28.43	26.77	23.16	24.71	14.69	4.90	163.75
DOE	1.70	3.71	10.05	9.00	16.49	14.48	10.51	17.42	14.69	4.90	102.95
NSF	0.00	0.00	0.00	16.63	11.94	12.29	12.65	7.29	0.00	0.00	60.80
US CMS	2.30	4.61	10.95	38.03	24.26	21.25	21.40	22.91	15.98	5.56	167.25
DOE	2.30	4.61	10.95	32.51	20.30	17.15	17.19	20.48	15.98	5.56	147.03
NSF	0.00	0.00	0.00	5.52	3.96	4.10	4.21	2.43	0.00	0.00	20.22
Detectors Total	4.00	8.32	21.00	63.66	52.69	48.02	44.56	47.62	30.67	10.46	331.00

TOTAL DOE & NSF FUNDS, COSTS, & COMMITMENTS (cumulative $000)‡

U.S. LHC Construction Project	A = Funds Allocated	B = Estimate Actual Costs	C = Open Commitments	D= B+C Total	A–D = Funds Available
U.S. ATLAS	119,448	84,512	3,199	87,711	31,737
U.S. CMS	122,792	83,688	18,312	102,000	20,792
U.S. LHC Accelerator	92,250	78,281	0	78281	13,969
CERN Direct Purchases	35,660	30,213	0	30,213	5,447
Total	363,582	276,694	21,511	298,205	71,945

* This report includes a revision to the funding profile for the U.S. LHC Construction Project that is addressed in the FY 2001 budget planning for DOE. The revision to the original profile was made in order to better match the needs of the construction projects. This report also includes a change in the distribution of funds between the U.S. LHC Accelerator project and the CERN direct project to address delays in CERN invoices.

† DOE has imposed a temporary 85% cap on expenditures of FY02 funds.

‡ Based on financial reports from the U.S. LHC construction projects. NSF funding is provided after the beginning of the fiscal year and therefore it is necessary to carry-over funding into the subsequent fiscal years.

7. DOE/NSF COST BASELINES AT LEVEL 2 (in $000)

U.S. ATLAS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Silicon System	17,795	930	18,725
1.2	Transition Radiation Tracker	9,194	241	9,435
1.3	Liquid Argon Calorimeter	43,771	13	43,784
1.4	Tile Calorimeter	9,290	221	9,511
1.5	Muon Spectrometer	26,391	- 5	26,386
1.6	Trigger/Data Acquisition System	10,957	16	10,973
1.7	Common Projects	9,179	0	9,179
1.8	Education	286	0	286
1.9	Project Management	8,279	0	8,279
1.10	Technical Coordination	450	850	1300
	Contingency	28,156	-2,264	25,892
	U.S. ATLAS Total Project Cost Baseline	163,750	0	163,750

U.S. CMS Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Endcap Muon	38,530	- 1	38,529
1.2	Hadron Calorimeter	39,290	470	39,760
1.3	Trigger and Data Acquisition	12,419	- 81	12,338
1.4	Electromagnetic Calorimeter	11,904	176	12,080
1.5	Forward Pixels	6,771	49	6,820
1.6	Common Projects	23,000	0	23,000
1.7	Project Office	6,545	- 16	6,529
1.8	Silicon	3,345	8	3,353
	Contingency	25,446	- 605	24,841
	U.S. CMS Total Project Cost Baseline	167,250	0	167,250

U.S. LHC Accelerator Cost Baseline

WBS	Description	Previous	Change	Current
1.1	Interaction Region Components	56,074	0	56,074
1.2	Radio Frequency Straight Section	15,983	0	15,983
1.3	Superconducting Wire and Cable	13,225	0	13,225
1.4	Accelerator Physics	3,359	0	3,359
1.5	Project Management	13,695	0	13,695
	Contingency	7,664	0	7,664
	U.S. LHC Accelerator Total Project Cost Baseline	110,000	0	110,000

8. SCHEDULE STATUS AND PLANS

8.1 U.S. ATLAS Construction Project Milestones

The milestones have been updated with the new ETC baseline dates.

U.S. ATLAS Major Project Milestones (Level 1)

Description	Baseline Schedule	Forecast (F) Date	Actual (A) Date
Project Start	01-Oct-95	01-Oct-95 (F)	01-Oct-95 (A)
Project Completion	30-Sep-05	30-Sep-05 (F)	

U.S. ATLAS Major Project Milestones (Level 2)

Subsystem	Schedule Designator	Description	Baseline Schedule	Forecast (F) / Actual (A) Date
Silicon (1.1)	SIL L2/1	Start Full Silicon Strip Electronics Production	06-Jul-01	15-Jul-01 (A)
	SIL L2/2	Start Full Strip Module Production	12-Apr-02	12-Apr-02 (F)
	SIL L2/3	ROD Design Complete	17-Apr-02	17-Apr-02 (F)
	SIL L2/4	Complete Shipment of Silicon Strip Module Production	17-Oct-03	17-Oct-03 (F)
	SIL L2/5	ROD Production/Testing Complete	13-Mar-03	13-Mar-03 (F)
	SIL L2/6	Pixels 1st IBM Prototype Submitted	26-Jul-01	12-Nov-01 (A)
	SIL L2/7	Pixels Start IBM Production	12-Jun-03	12-Jun-03 (F)
	SIL L2/8	Pixels Start IBM Outer Bare Module Prod	29-Jan-04	29-Jan-04 (F)
	SIL L2/9	Pixels Disk System at CERN	20-Jan-05	20-Jan-05 (F)
TRT (1.2) Mechanical	TRT L2/1	Final Design Complete	31-Dec-98	07-Dec-98 (A)
	TRT L2/2	Module Production Complete (CUM 102)	31-Dec-03	31-Dec-03 (F)
	TRT L2/3	Barrel Construction Complete	10-Mar-04	10-Mar-04 (F)
Electrical	TRT L2/4	Select Final Elec Design	15-Jun-01	30-Aug-00 (A)
	TRT L2/5	Start Production of ASICS	09-Jul-02	09-Jul-02 (F)
	TRT L2/6	Installation Complete	04-Jan-05	04-Jan-05 (F)
LAr Cal (1.3)	LAr L2/1	Cryostat Contract Award	24-Jul-98	05-Aug-98 (A)
	LAr L2/2	Barrel Feedthroughs Final Design Review	30-Sep-98	02-Oct-98 (A)
	LAr L2/3	Start Electronics Production (Preamps)	30-Jun-00	30-Jun-00 (A)
	LAr L2/4	FCAL Mechanical Design Complete	14-Dec-98	15-Dec-99 (A)
	LAr L2/6	Level 1 Trigger Final Design Complete	30-Mar-02	30-Jun-02 (F)
	LAr L2/7	ROD Final Design Complete	12-Dec-02	12-Dec-02 (F)
	LAr L2/8	Motherboard System Production Complete	30-Sep-02	30-Sep-02 (F)
	LAr L2/9	Cryostat Arrives at CERN	15-May-01	02-Jul-01 (A)
	LAr L2/10	Barrel Feedthroughs Production Complete	01-Jun-02	01-Jun-02 (F)
	LAr L2/11	FCAL-C Delivered to EC	15-Jan-03	15-Jan-03 (F)
	LAr L2/12	FCAL-A Delivered to EC	04-Nov-03	04-Nov-03 (F)

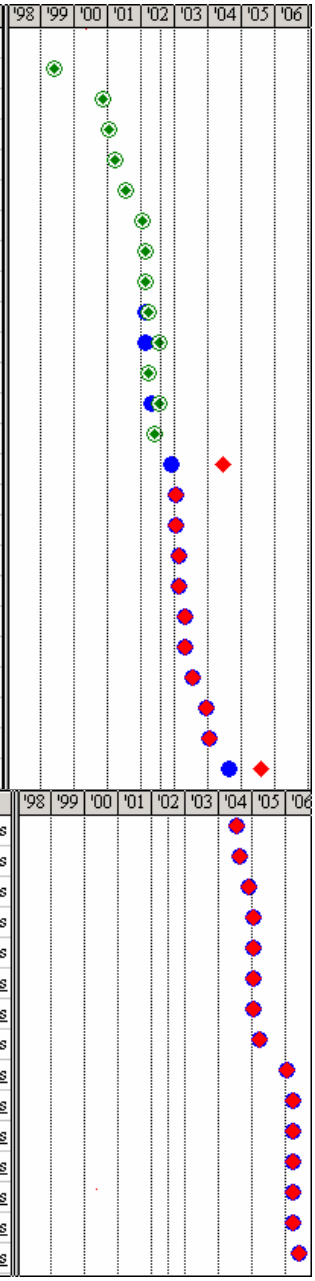
U.S. ATLAS Major Project Milestones (Level 2) (Continued)

Subsystem	Schedule Designator	Description	Baseline Schedule	Forecast (F) / Actual (A) Date
Tile Cal (1.4)	Tile L2/1	Start Submodule Procurement	01-Sep-97	01-Sep-97 (A)
	Tile L2/2	Technology Choice for F/E Electronics	15-Nov-97	15-Nov-97 (A)
	Tile L2/3	Start Module Construction	01-May-99	20-Sep-99 (A)
	Tile L2/4	Start Production of Motherboards	01-Apr-01	30-Mar-01 (A)
	Tile L2/5	All Electronic Components Delivered to CERN	01-Oct-02	01-Oct-02 (F)
	Tile L2/6	Module Construction Complete	30-Sept-02	30-Sep-02 (F)
	Tile L2/7	All Modules Delivered to CERN	02-Dec-02	02-Dec-02 (F)
Muon (1.5)	Muon L2/1	Start MDT Chambers Lines 1 and 3	17-Jul-00	15-Sep-00 (A)
	Muon L2/2	Start CSC Chamber Production	01-Sep-01	01-Oct-01 (A)
	Muon L2/3	MDT Electronics ASD PRR	01-Apr-02	01-May-02 (F)
	Muon L2/4	Final Design of Global Alignment Devices Complete	01-Aug-02	01-Aug-02 (F)
	Muon L2/5	CSC IC Production Complete	31-Oct-02	31-Oct-02 (F)
	Muon L2/6	Kinematic Mount Design Complete	30-Jan-01	30-Jan-01 (A)
	Muon L2/7	MDT Chambers (U.S.) Production Complete	14-Sep-04	14-Sep-04 (F)
	Muon L2/8	Kinematic Mount Production Complete	22-Sep-03	22-Sep-03 (F)
	Muon L2/9	CSC ROD Production Complete	05-Nov-03	05-Nov-03 (F)
	Muon L2/10	MDT Elec.'s Mezzanine Production Complete	26-Sep-03	26-Sep-03 (F)
	Muon L2/12	Global Alignment System Final Delivery	30-Sep-04	30-Sep-04 (F)
Trigger/ DAQ (1.6)	TDAQ L2/1	Select Final LVL2 Architecture	31-Dec-99	31-Mar-00 (A)
	TDAQ L2/2	LVL2 Trigger Design Complete	31-Dec-02	31-Dec-02 (F)
	TDAQ L2/3	LVL2 Trigger Prototype Complete	30-Sep-02	30-Sep-02 (F)
	TDAQ L2/4	Start Production	08-Jan-03	08-Jan-03 (F)
	TDAQ L2/5	Start Installation & Commissioning	05-Mar-03	05-Mar-03 (F)
	TDAQ L2/6	Production Complete	30-Jul-05	30-Jul-05 (F)
	TDAQ L2/7	LVL2 Installation & Commissioning Complete	30-Sep-05	30-Sep-05 (F)

8.2 U.S. CMS Construction Project Milestones

DOE/NSF Project Manager and U.S. CMS Project Management Group (PMG) Chair milestones (below) are under Change Control as described in the US CMS Project Management Plan. Any 3 month change from the previously approved date in these milestone requires the approval of the DOE/NSF Project Manager and PMG Chair.

System	Level?	CMS ID	Milestone	v27	v31	Start	Variance
			US CMS APM-DD Milestones	**NA**	**NA**	**Jan 31 '99**	**0 days**
HCAL	ML3*	HB-024	HB: Start Optics Production	Jan 31 '99	Jan 31 '99	Jan 31 '99	0 days
MUON	ML2*	M-011	Begin Assembly of Cathode Strip Chambers at I	Oct 31 '99	Jul 14 '00	Jul 14 '00	0 days
HCAL	ML3*	HB-026	HB-1 Optical Assemblies 100% Complete	Jul 31 '00	Sep 30 '00	Sep 30 '00	0 days
HCAL	ML2*	HB-010	HB-1 Absorber Delivered to CERN	Nov 30 '00	Nov 30 '00	Nov 30 '00	0 days
MUON	ML2*	M-013	Begin Mass Production of Electronics Boards	Aug 31 '00	Mar 31 '01	Mar 31 '01	0 days
HCAL	ML2*	HB-014	HB+1 Absorber Delivered to CERN	Dec 31 '01	Sep 30 '01	Sep 30 '01	0 days
HCAL	ML3*	HL-039	HF: Start PMT Procurement	Oct 31 '01	Oct 31 '01	Oct 31 '01	0 days
HCAL	ML1*	HB-016	HB-1 End Module Assembly in SX5	NA	Oct 31 '01	Oct 31 '01	0 days
CP	ML3*	S-059	End Assembly of YE+3	Oct 31 '01	Oct 31 '01	Nov 30 '01	22 days
SiTrkr	ML2*	T-027	Begin Sensor Module Construction (for M200)	NA	Oct 31 '01	Apr 1 '02	97 days
MUON	ML2*	M-014	Begin Mounting Electronics and Testing at UCI	Sep 30 '00	Nov 30 '01	Nov 30 '01	0 days
HCAL	ML3*	HB-029	HB+1 Optical Assemblies 100% Complete	Dec 31 '01	Dec 31 '01	Mar 31 '02	61 days
HCAL	ML3*	HL-005	Start HPD Procurement	Oct 31 '99	Jan 31 '02	Jan 31 '02	0 days
SiTrkr	ML2*	T-1070	25% of Rods Complete	NA	Jul 31 '02	Mar 1 '04	390 days
HCAL	ML2*	HL-011	HF: PMT Tests 100% Complete	NA	Sep 30 '02	Sep 30 '02	0 days
ECAL	ML-US	4.3.8.11m	Second Laser Installed & Delivered	NA	Oct 1 '02	Oct 1 '02	0 days
ECAL	ML3*	E-027	ECAL Front-End Electronics Production Launcl	Apr 30 '00	Oct 31 '02	Oct 31 '02	0 days
HCAL	ML1*	HB-017	End Assembly of HB+ (Barrel) in SX5	Jul 31 '02	Oct 31 '02	Oct 31 '02	0 days
FPIX	ML2*	T-1002	Final Full Size ROC Submission(0.25micron)	NA	Dec 31 '02	Dec 31 '02	0 days
HCAL	ML3*	HL-014	QIE ASIC Production Run Complete	NA	Dec 31 '02	Dec 31 '02	0 days
HCAL	ML2*	HL-002	HCAL Front-End Electronics Production Compl	Jun 30 '01	Mar 31 '03	Mar 31 '03	0 days
HCAL	ML2*	HL-018	HCAL HPD Tests 100% Complete	NA	Aug 31 '03	Aug 31 '03	0 days
MUON	ML2*	M-017	All 148 ME23/2 CSC's Delivered from UC/UF to	Oct 31 '03	Sep 30 '03	Sep 30 '03	0 days
SiTrkr	ML2*	T-1077	Delivery of TOB to the Tracker	NA	Apr 30 '04	Apr 15 '05	239 days
FPIX	ML2*	T-1015	First Butterfly Ready	NA	Mar 31 '04	Mar 31 '04	0 days
ECAL	ML3*	E-045	All APDs Delivered	Feb 28 '04	Apr 30 '04	Apr 30 '04	0 days
DAQ	ML2*	D-1014	Start of Readout and EVB Commissioning	NA	Jul 31 '04	Jul 31 '04	0 days
ECAL	ML3*	E-046	ECAL Front-End Electronics Production Compl	May 31 '04	Sep 30 '04	Sep 30 '04	0 days
CP	ML1*	G-1010	UX Ready (Start Lowering Magnet Parts)	NA	Sep 30 '04	Sep 30 '04	0 days
ECAL	ML-US	4.6.1.8m	FPPA Delivery Complete	NA	Oct 1 '04	Oct 1 '04	0 days
ECAL	ML-US	4.6.3.9m	Optical Link Delivery Complete	NA	Oct 1 '04	Oct 1 '04	0 days
TRIG	ML3*	D-1350	CSC: MPC Prod Test Complete	NA	Nov 30 '04	Nov 30 '04	0 days
FPIX	ML2*	T-1020	Ship Pixel Tracker Endcaps to SX5	NA	Sep 30 '05	Sep 30 '05	0 days
MUON	ML1*	M-1083	End UX Inst/Cabling/Test on ME Stations on Y	Mar 31 '05	Nov 30 '05	Nov 30 '05	0 days
HCAL	ML1*	HB-023	End Cabling and Test of HB in UX5	May 31 '04	Nov 30 '05	Nov 30 '05	0 days
HCAL	ML1*	HE-015	End Cabling and Test of HE-1 in UX5	Jul 31 '04	Nov 30 '05	Nov 30 '05	0 days
HCAL	ML1*	HF-025	HF: Installation and Testing in UX5 Complete	Jun 30 '05	Nov 30 '05	Nov 30 '05	0 days
TRIG	ML2*	D-1008	Finish Trigger Installation	NA	Nov 30 '05	Nov 30 '05	0 days
DAQ	ML2*	D-1023	DAQ.0: 25% Performance Installed	NA	Jan 31 '06	Jan 31 '06	0 days

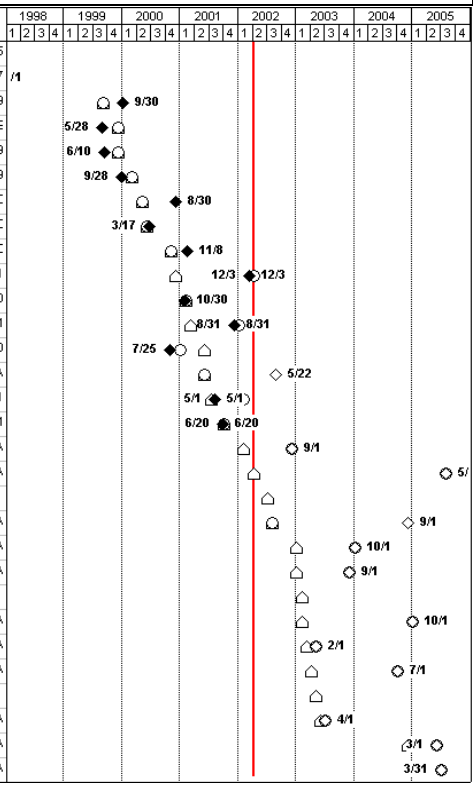


8.3 U.S. LHC Accelerator Construction Project Milestones

Table 8.3 Level 2 U.S. LHC Accelerator Baseline Milestones through 2002

WBS Identifiers	Milestone Description	Baseline Date	Forecast(F) or Actual(A)
Project	Decision as to whether or not the US Project includes RF region quadrupoles	1 Jul 01	20 Jun 01 (A)
Int Region	Begin 1st inner triplet quadrupole model magnet	1 Jul 97	1 Jul 97 (A)
Int Region	Complete inner triplet quadrupole model magnet program phase 1	1 Dec 99	28 Sep 99 (A)
Int Region	Complete inner triplet quadrupole model magnet program phase 2	1 Mar 00	17 Mar 00 (A)
Int Region	Place purchase order for HTS power leads	1 Feb 00	30 Aug 00 (A)
Int Region	Begin absorber fabrication	1 Nov 00	30 Oct 00 (A)
Int Region	Complete inner triplet quadrupole prototype program	1 Oct 01	31 Aug 01 (A)
Int Region	Begin IR beam separation dipole production assembly	1 Oct 00	25 Jul 00 (A)
Int Region	Begin inner triplet feedbox fabrication	1 Mar 01	**22 May 02 (F)**
Int Region	Begin inner triplet quadrupole production assembly	1 Nov 01	1 May 01 (A)
Int Region	Complete 1st inner triplet quadrupole magnet	1 Sep 02	1 Sep 02 (F)
Int Region	Complete inner triplet feedbox fabrication	1 May 02	**1 Sep 04 (F)**
RF Region	Begin assembly of 1st dipole model magnet	1 Sep 99	10 Jun 99 (A)
RF Region	Complete dipole model magnet program	1 Aug 00	8 Nov 00 (A)
RF Region	Begin RF region dipole production assembly	1 Jan 02	31 Dec 01 (A)
SC Cable	All cable prod. support equipment delivered to CERN	1 Sep 99	28 May 99 (A)
SC Cable	Complete SC testing facility upgrades	1 Jun 99	30 Sep 99 (A)

Number	ID	Milestone	Revised	Forecast	Actual
1-1		Project Start (10/1/95)	Sun 10/1/95	Sun 10/1/95	Sun 10/1/95
2-1.1-1	IR	Begin 1st Inner Triplet Quadrupole Model Magnet	Tue 7/1/97	Tue 7/1/97	Tue 7/1/97
2-1.3-1	SC	Complete Superconductor Test Facility Upgrades	Tue 6/1/99	Thu 9/30/99	Thu 9/30/99
2-1.3-2	SC	All Cable Production Support Equipment Delivered to CERN	Wed 9/1/99	Fri 5/28/99	Fri 5/28/99
2-1.2-1	RF	Begin Assembly of 1st Dipole Model Magnet	Wed 9/1/99	Thu 6/10/99	Thu 6/10/99
2-1.1-2	IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 1	Wed 12/1/99	Tue 9/28/99	Tue 9/28/99
2-1.1-4	IR	Place Purchase Order for HTS Power Leads	Tue 2/1/00	Wed 8/30/00	Wed 8/30/00
2-1.1-3	IR	Complete Inner Triplet Quadrupole Model Magnet Program Phase 2	Wed 3/1/00	Fri 3/17/00	Fri 3/17/00
2-1.2-2	RF	Complete Dipole Model Magnet Program	Tue 8/1/00	Wed 11/8/00	Wed 11/8/00
2-1.2-3	RF	Begin RF Region Dipole Production Assembly	Tue 1/1/02	Mon 12/3/01	Mon 12/3/01
2-1.1-5	IR	Begin Absorber Fabrication	Wed 11/1/00	Mon 10/30/00	Mon 10/30/00
2-1.1-6	IR	Complete Inner Triplet Quadrupole Prototype Magnet Program	Mon 10/1/01	Fri 8/31/01	Fri 8/31/01
2-1.1-7	IR	Begin Interaction Region Beam Separation Dipole Prod. Assembly	Sun 10/1/00	Tue 7/25/00	Tue 7/25/00
2-1.1-8	IR	Begin Inner Triplet Feedbox Fabrication	Thu 3/1/01	Wed 5/22/02	NA
2-1.1-9	IR	Begin Inner Triplet Quadrupole Production Assembly	Thu 11/1/01	Tue 5/1/01	Tue 5/1/01
1-2		Decision on RF Region Quadrupoles	Sun 7/1/01	Wed 6/20/01	Wed 6/20/01
2-1.1-10	IR	Complete 1st Inner Triplet Quadrupole Magnet	Sun 9/1/02	Sun 9/1/02	NA
2-1.2-4	RF	Delivery of D3, D4 for IR4 right	Sun 5/1/05	Sun 5/1/05	NA
2-1.1-11	IR	Delivery of D2 for IR8 Left **DELETED**			
2-1.1-12	IR	Complete Inner Triplet Feedbox Fabrication	Wed 5/1/02	Wed 9/1/04	NA
2-1.1-13	IR	Delivery of All Inner Triplet System Components for IR8 Left (MQX,DFI	Wed 10/1/03	Wed 10/1/03	NA
2-1.2-5	RF	Complete RF Region Dipole Production Assembly	Mon 9/1/03	Mon 9/1/03	NA
2-1.1-14	IR	Delivery of D2 for IR5 Left **DELETED**			
2-1.2-6	RF	Delivery of D3, D4 for IR4 left	Fri 10/1/04	Fri 10/1/04	NA
2-1.1-15	IR	Complete Absorber Fabrication	Sat 2/1/03	Sat 2/1/03	NA
2-1.1-16	IR	Delivery of All Inner Triplet System Components for IR8 Right (MQX,DF	Thu 7/1/04	Thu 7/1/04	NA
2-1.1-17	IR	Delivery of D2 for IR8 Right**DELETED**			
2-1.1-18	IR	Complete Interaction Region Dipole Production Assembly	Tue 4/1/03	Tue 4/1/03	NA
2-1.1-30	IR	Complete Inner Triplet Quadrupole Production	Tue 3/1/05	Tue 3/1/05	NA
2-1.3-3	SC	Series Wire and Cable Testing Complete	Thu 3/31/05	Thu 3/31/05	NA



9. TECHNICAL BASELINE STATUS

U.S. ATLAS Construction Project - No change. The U.S. ATLAS collaboration defined a list of initial deliverables representing the U.S. contribution to ATLAS. This list was approved by the JOG in March 1998. Deliverables are listed in the U.S. ATLAS Construction Project Management Plan, Appendix 3.

U.S. CMS Construction Project - No change. The U.S. CMS collaboration defined a list of deliverables representing the U.S. contribution to CMS. This list was approved by the JOG in October 1998. The scope of U.S. CMS contribution is described in the U.S. CMS Management Plan, Appendix 2.

U.S. LHC Accelerator Construction Project - No change. U.S. LHC Accelerator Project - The U.S. deliverables to CERN are defined in the Implementing Arrangement to the Accelerator Protocol. The Implementing Arrangement was signed by the CERN and U.S. signatories in July 1998. Reference the U.S. LHC Accelerator Project Management Plan, Annex II, (Approved 6/15/98).

CERN Direct Purchases - No change. CERN will procure from U.S. industrial firms supplies required to construct the LHC accelerator. These supplies will include superconducting alloy, cable, insulation, and other materials.

10. BASELINE CHANGE ACTIVITY

Baseline Control Level	Baseline Changes
Level 1, DOE/NSF Joint Oversight Group	No Changes this quarter
Level 2, DOE/NSF Project Office	
U.S. ATLAS	Changes to the Level 2 cost, scope and schedule baseline.
U.S. CMS	Changes to the Level 2 cost, scope and schedule baseline.
U.S. LHC Accelerator	No changes.

Project Manager's Quarterly Progress Report – 2nd Quarter FY 2002
U.S. Large Hadron Collider Construction Project

APPENDIX A - FUNDING BY INSTITUTION (in thousands of dollars)

U.S. CMS Construction Project

	FY 1998				FY 1999				FY 2000				FY 2001				
	DOE				DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Total
FNAL	0	5,517	0	5,517	0	10,817	40	10,857	0	5,981	0	5,981	0	6,033	0	6,033	28,388
Fairfield	0	29	0	29	0	0	0	0	0	10	0	10	0	13	0	13	52
Maryland	90	65	0	155	0	132	131	263	0	250	0	250	0	189	0	189	857
Boston U.	0	32	0	32	31	111	0	142	0	132	0	132	0	88	0	88	394
Florida State	60	54	0	114	71	118	0	189	80	54	0	134	68	43	0	111	548
U. of Minnesota	60	95	0	155	161	452	0	613	141	202	0	343	153	401	0	554	1,665
U. of Iowa	77	62	0	139	20	5	0	25	0	453	0	453	0	843	0	843	1,460
U. of Rochester	127	1,159	0	1,286	262	485	0	747	441	253	0	694	464	143	0	607	3,334
Notre Dame	0	52	0	52	0	44	184	228	0	14	193	207	0	14	112	126	613
Purdue	38	135	0	173	49	166	0	215	0	175	0	175	0	89	0	89	652
U. of Miss.	46	100	0	146	68	91	0	159	69	108	0	236	0	235	0	235	776
U. of Florida	44	95	0	139	184	412	0	596	332	853	0	1,185	432	293	0	725	2,645
Ohio State U.	140	64	0	204	275	212	0	487	196	732	0	928	151	700	0	851	2,470
Carnegie Mellon	0	113	0	113	0	291	0	291	0	312	0	312	0	258	0	258	974
Rice	138	19	0	157	102	56	0	158	132	16	0	148	196	36	0	232	695
U. of Wisconsin	533	1,052	0	1,585	471	3,598	0	4,069	722	2,995	0	3,717	504	4,489	0	4,993	14,364
U.C. Davis	34	100	0	134	0	78	0	78	0	502	0	502	0	63	0	63	777
UCLA	150	87	0	237	249	173	0	422	244	391	0	635	347	546	42	935	2,229
U.C. Riverside	20	10	0	30	0	164	0	164	0	70	0	70	0	72	0	72	336
John Hopkins	0	29	0	29	0	0	70	70	0	0	40	40	0	0	5	5	144
Northwestern	0	59	0	59	5	26	0	31	0	114	0	114	0	39	0	39	243
Rutgers	0	13	0	13	0	0	34	34	0	2	140	142	0	0	101	101	290
Princeton	0	256	0	256	0	626	0	626	0	667	0	667	0	133	0	133	1,682
Caltech	0	148	0	148	0	458	0	458	0	367	0	367	0	452	0	452	1,425
U.C. San Diego	11	0	0	11	11	90	24	125	36	0	0	36	0	43	0	43	215
Northeastern	0	0	0	0	0	0	3,370	3,370	0	0	1,741	1,741	0	0	1,482	1,482	6,593
U. Ill.-Chicago	0	0	0	0	0	0	124	124	0	0	309	309	0	0	262	262	695
U. of Nebraska	0	0	0	0	0	0	24	24	0	0	2	2	0	0	100	100	126
MIT	0	37	0	37	15	67	0	82	0	78	0	78	0	87	0	87	284
Iowa State	0	0	0	0	0	0	19	19	0	356	0	356	0	29	0	29	404
Kansas State													0	66	0	66	66
LBL													0	554	0	554	554
Texas Tech													0	876	0	876	876
UC Santa Barbara													0	13	0	13	13
U. of Kansas													0	0	6	6	6
Subtotal	1,568	9,382	0	10,950	1,974	18,672	4,020	24,666	2,393	15,087	2,425	19,964	2,315	16,840	2,110	21,265	75,330

APPENDIX B - FUNDING BY INSTITUTION (in thousands of dollars)

U.S. ATLAS Construction Project																	
	FY 1998				FY 1999				FY 2000				FY 2001				
	DOE				DOE				DOE				DOE				Grand
Institution	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contract	NSF	Total	Grant	Contra	NSF	Total	Total
ANL	0	1,098	0	1,098	0	967	0	967	0	922	0	922	0	172	0	172	3,159
BNL	0	3,903	0	3,903	0	2,581	0	2,581	0	6,429	0	6,429	0	6,630	0	6,630	19,543
LBNL	0	633	0	633	0	715	0	715	0	420	0	420	0	1,575	0	1,575	3,343
SUNY/Albany	20	0	0	20	48	0	0	48	50	0	0	50	0	0	0	0	118
U. of Arizona	320	100	0	420	634	0	0	634	557	0	0	557	298	0	0	298	1,909
Boston U.	224	0	0	224	298	0	0	298	287	0	0	287	155	0	0	155	964
Brandeis U.	265	45	0	310	0	0	593	593	0	0	478	478	0	0	731	731	2,112
U.C.Irvine	193	0	0	193	0	0	93	93	0	0	0	0	0	0	266	266	552
U.C. Santa Cruz	404	0	0	404	63	0	0	63	0	0	568	568	0	0	2,702	2,702	3,107
U. of Chicago	0	54	0	54	0	0	1,069	1,069	0	0	264	264	0	0	723	723	2,110
Duke U.	190	0	0	190	601	0	0	601	417	0	0	417	501	0	0	501	1,709
Hampton U.	0	0	0	0	0	0	538	538	0	0	293	293	0	0	331	331	1,162
Harvard	234	0	0	234	0	0	654	654	0	0	390	390	0	0	3,882	3,882	5,070
U. of Illinois	50	159	0	209	347	0	0	347	294	0	0	294	76	0	0	76	926
Indiana U.	190	0	0	190	765	0	0	765	460	0	0	460	0	616	0	616	2,031
MIT	50	0	0	50	105	0	0	105	177	0	0	177	190	0	0	190	522
Michigan State	0	35	0	35	0	0	178	178	0	0	293	293	0	0	0	0	506
Nevis/Columbia	0	675	0	675	0	0	2,680	2,680	0	0	1,422	1,422	0	0	103	103	4,880
U. of New Mex.	20	0	0	20	30	0	0	30	24	0	0	24	0	80	0	80	154
Northern Illinois	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ohio State U.	0	0	0	0	100	0	0	100	45	0	0	45	0	0	0	0	145
U. of Michigan	62	254	0	316	716	0	0	716	518	0	0	518	681	0	0	681	2,231
U. of Oklahoma	30	0	0	30	0	0	41	41	0	0	51	51	0	0	49	0	171
U. of Penn.	250	0	0	250	300	0	0	300	265	0	0	265	679	0	0	679	1,494
U. of Pittsburg	110	0	0	110	0	0	150	150	0	0	210	210	0	50	0	50	520
U. of Rochester	0	0	0	0	0	0	3,587	3,587	0	0	1,664	1,664	0	0	0	0	5,251
U.T. Arlington	50	82	0	132	0	0	474	474	0	0	230	230	0	0	0	0	836
S. Methodist	40	0	0	40	124	0	0	124	30	0	0	30	87	0	0	87	281
SUNY/Stony B.	27	0	0	27	0	0	1,045	1,045	0	0	1,037	1,037	0	0	426	426	2,535
Tufts University	50	0	0	50	20	0	0	20	20	0	0	20	0	0	0	0	90
U. Washington	0	0	0	0	0	0	240	240	0	0	318	318	0	0	1,377	1,377	1,935
U. of Wisconsin	230	0	0	230	429	0	0	429	665	0	0	665	1,014	0	0	1,014	2,338
Subtotal	3,009	7,038	0	10,047	4,580	4,263	11,342	20,185	3,809	7,771	7,218	18,798	3,920	9,123	10,590	22,625	71,704
Reserve	0	3	0	3	157	0	5,289	5,446	327	1,936	1,795	4,058	0	300	0	300	9,807
									0	2,602	2,928	5,530	0	0	0	0	0
Total	3,009	7,041	0	10,050	4,737	4,263	16,631	25,631	4,136	12,309	11,941	28,386	3,920	9,423	10,590	22,925	81,511